RESEARCH PAPER

A Comparative Study of Endotracheal Intubation Versus Baska Mask in Laparoscopic Surgery Under General Anaesthesia with Controlled Ventilation

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ABSTRACT

Background: Airway management is a crucial aspect of general anaesthesia, especially in laparoscopic surgeries requiring controlled ventilation. Endotracheal intubation (ETT) has traditionally been the gold standard; however, it is associated with significant hemodynamic responses and postoperative complications. The Baska mask, a third-generation supraglottic airway device, has emerged as a potential alternative offering effective ventilation with minimal airway trauma.

Aims and Objectives: To compare the efficacy of the Baska mask with endotracheal intubation in adult patients undergoing laparoscopic surgeries under general anaesthesia with controlled ventilation, with respect to ease of insertion, number of attempts, hemodynamic changes, adequacy of ventilation, and postoperative complications.

Results: A total of 80 patients were equally divided into two groups. Both groups were comparable in demographic characteristics. First-attempt insertion success was 95% in both groups. Ease of insertion was slightly better with the Baska mask. Hemodynamic parameters including heart rate, systolic, diastolic, and mean arterial pressures were significantly higher in the ETT group compared to the Baska mask group ($p < 0.05$). Oxygenation (SpO_2) was maintained equally in both groups, while $EtCO_2$ was better controlled in the Baska mask group at certain intervals. Postoperative complications such as sore throat and dysphagia were significantly higher in the ETT group ($p < 0.001$).

Conclusion: The Baska mask is an effective and safe alternative to endotracheal intubation, offering comparable ease of insertion and ventilation with the added advantages of better hemodynamic stability and fewer postoperative complications.

Keywords: Baska mask, Endotracheal intubation, Laparoscopic surgery, Airway management, Hemodynamic response, Supraglottic airway device, Controlled ventilation, Postoperative complications, SpO_2, $EtCO_2$.

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INTRODUCTION

Airway management is a fundamental component of anaesthetic practice, particularly in patients undergoing laparoscopic surgeries under general anaesthesia with controlled ventilation (1). Traditionally, endotracheal intubation has been considered the gold standard technique for securing the airway, as it provides a definitive airway, protects against aspiration, and allows effective ventilation (2). However, the process of laryngoscopy and intubation is not without drawbacks. It is associated with significant sympathetic stimulation leading to tachycardia and hypertension, as well as mechanical trauma to the oropharyngeal and laryngeal structures (3). These responses may be particularly detrimental in patients with underlying cardiovascular comorbidities (4).

In recent years, supraglottic airway devices (SADs) have emerged as effective alternatives to endotracheal tubes in selected surgical procedures. These devices are designed to sit above the glottis and provide a less invasive means of airway management (5). The

evolution of SADs from first-generation devices to more advanced second- and third-generation devices has led to significant improvements in airway sealing, protection against aspiration, and ease of insertion (6). Among these, the Baska mask represents a third-generation supraglottic airway device with several innovative features aimed at overcoming the limitations of earlier devices (7).

The Baska mask is uniquely designed with a self-sealing, non-inflatable cuff that adapts dynamically to airway pressures during positive pressure ventilation (8). This design allows for improved oropharyngeal seal without the need for cuff inflation, thereby reducing the risk of mucosal injury and nerve damage associated with overinflation (9). Additionally, the presence of dual gastric drainage channels facilitates effective suctioning of gastric contents, thereby minimizing the risk of regurgitation and aspiration (10). The device is also anatomically contoured and includes features such as a bite block and adjustable tab, which contribute to ease of insertion and stability during use (11).

Laparoscopic surgeries pose specific challenges for airway management due to the effects of pneumoperitoneum and increased intra-abdominal pressure, which can compromise respiratory mechanics and increase the risk of aspiration (12). Adequate airway sealing and effective ventilation are therefore essential in these procedures. While endotracheal intubation reliably meets these requirements, it may lead to exaggerated hemodynamic responses and postoperative airway complications such as sore throat, dysphagia, and hoarseness (13). In contrast, the Baska mask has been shown to provide effective ventilation with reduced hemodynamic disturbances and a lower incidence of postoperative complications (14).

Despite the growing popularity of supraglottic airway devices, there remains a need for robust comparative studies evaluating their performance against endotracheal intubation, particularly in the setting of laparoscopic surgeries. Parameters such as ease of insertion, number of attempts, hemodynamic responses, adequacy of ventilation, and incidence of perioperative and postoperative complications are critical in determining the suitability of these devices for routine clinical use (15).

Therefore, the present study aims to compare the efficacy and safety of the Baska mask with endotracheal intubation in adult patients undergoing laparoscopic surgeries under general anaesthesia with controlled ventilation". By evaluating key clinical parameters, this study seeks to determine whether the Baska mask can serve as a reliable and less invasive alternative to endotracheal intubation in modern anaesthetic practice.

MATERIALS AND METHODS

This study was conducted on 80 patients of either sex, aged between 18 and 60 years, who were scheduled to undergo elective laparoscopic surgeries under general anaesthesia with controlled ventilation. "All patients were selected after obtaining informed written consent. The study population was randomly divided into two groups comprising 40 patients each. Group E included patients in whom airway management was achieved using endotracheal intubation, while Group B included patients in whom the Baska mask was used as the airway device.

Standard preoperative evaluation was carried out for all patients, and routine monitoring was instituted intraoperatively, including heart rate, blood pressure, arterial oxygen saturation (SpO_2), and end tidal carbon dioxide ($EtCO_2$). After induction of general anaesthesia, the assigned airway device was inserted according to the group allocation. The ease of insertion and the number of attempts required for successful placement were recorded. Adequacy of ventilation during positive pressure ventilation was assessed clinically and with monitoring parameters.

Hemodynamic parameters such as heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure were recorded at baseline and at regular intervals following insertion of the airway device. In addition, intraoperative and postoperative complications were noted in both groups, including regurgitation, aspiration, airway trauma, sore throat, dysphagia, and hoarseness". The collected data were compared between the two groups to evaluate the efficacy and safety of the Baska mask in comparison with endotracheal intubation.

RESULT

TABLE 1: DEMOGRAPHIC PROFILE (Baseline Comparability)

Parameter	Group B (BASKA)	Group E (ETT)	p value
Mean Age (yrs)	31.0 ± 9.6	33.4 ± 9.6	0.29
Gender (M/F)	16 / 24	13 / 27	0.48
Mean Weight (kg)	57.9 ± 6.87	60.9 ± 7.62	0.07

ASA I/II	36/4	34/6	0.50

The demographic variables including age, gender distribution, weight, and ASA status were comparable between both groups. ¨There was no statistically significant difference observed ($p > 0.05$). This indicates that both groups were well matched at baseline. Hence, any differences in outcomes can be attributed to the airway device rather than confounding factors.

TABLE 2: NUMBER OF INSERTION ATTEMPTS

Attempts	Group B (%)	Group E (%)
1st attempt	95%	95%
2nd attempt	5%	5%

The majority of patients in both groups (95%) were successfully managed in the first attempt, with only 5% requiring a second attempt. There was no difference between the two groups. This suggests that both BASKA mask and endotracheal intubation have similar success rates in terms of insertion attempts.

TABLE 3: EASE OF INSERTION

Ease	Group B (%)	Group E (%)	p value
Easy	90%	80%	0.46
Moderately difficult	5%	10%	
Difficult	5%	10%	

Insertion was easy in a higher proportion of patients in the BASKA mask group (90%) compared to the ETT group (80%), although the difference was not statistically significant. Moderate and difficult insertions were slightly more frequent in the ETT group. Overall, both devices showed comparable ease of insertion, with a slight advantage for the BASKA mask.

TABLE 4: HEART RATE COMPARISON

Time	Group B	Group E	p value
Baseline	Comparable	Comparable	NS
1 min	Lower	Higher	Significant
5 min	Lower	Higher	<0.001
10 min	Lower	Higher	<0.001
Post-extubation	Lower	Higher	<0.001

Baseline heart rate was comparable in both groups. However, after insertion, heart rate increased significantly in the ETT group compared to the BASKA group at all time intervals. This indicates that BASKA mask insertion produces less sympathetic stimulation and better hemodynamic stability.

TABLE 5: SYSTOLIC BLOOD PRESSURE

Time	Group B	Group E	p value
Baseline	Comparable	Comparable	NS
1 min	Lower	Higher	Significant
5 min	Lower	Higher	<0.001
10 min	Lower	Higher	<0.001
Post-extubation	Lower	Higher	<0.001

Systolic blood pressure was comparable at baseline between the groups. Following insertion, there was a significant increase in SBP in the ETT group, whereas values in the BASKA group returned closer to baseline. This demonstrates that BASKA mask is associated with a lesser pressor response.

TABLE 6: DIASTOLIC BLOOD PRESSURE

Time	Group B	Group E	p value
Baseline	Comparable	Comparable	NS
1–10 min	Lower	Higher	Significant

Diastolic blood pressure remained similar at baseline in both groups. Post-insertion, DBP showed a significant rise in the ETT group compared to the BASKA group. The BASKA mask maintained more stable DBP values, indicating reduced cardiovascular stress.

TABLE 7: MEAN ARTERIAL PRESSURE

Time	Group B	Group E	p value
Baseline	Comparable	Comparable	NS

1–10 min	Lower	Higher	<0.001

Mean arterial pressure was comparable at baseline. However, significant increases were observed in the ETT group at all measured intervals, while the BASKA group showed relatively stable values. This further confirms superior hemodynamic stability with the BASKA mask.

TABLE 8: SpO_2 COMPARISON

Time	Group B	Group E	p value
All intervals	Maintained >97%	Maintained >97%	NS

Oxygen saturation remained above 97% in both groups throughout the procedure, with no statistically significant differences at any time point. This indicates that both airway devices are equally effective in maintaining adequate oxygenation during laparoscopic surgeries.

TABLE 9: $EtCO_2$ COMPARISON

Time	Group B	Group E	p value
Baseline	Comparable	Comparable	NS
1–10 min	Better control	Slightly higher	Significant

End tidal CO_2 values were comparable at baseline. During the procedure, $EtCO_2$ was better maintained in the BASKA group, with some statistically significant differences at certain intervals. This suggests that ventilation was effectively maintained with both devices, with slight superiority in the BASKA group.

TABLE 10: POSTOPERATIVE COMPLICATIONS

Complication	Group B (%)	Group E (%)	p value
Dysphagia	2.5	35	<0.001
Sore throat	2.5	40	<0.001
Regurgitation	7.5	5	0.65
Laryngospasm	0	0	—
Injury	0	0	—

Postoperative complications such as sore throat and dysphagia were significantly higher in the ETT group compared to the BASKA group ($p < 0.001$). There was no difference in laryngospasm or airway injury". This indicates that the BASKA mask is associated with fewer postoperative airway-related complications.

DISCUSSION

The present comparative study evaluated the performance of the Baska mask and endotracheal intubation in adult patients undergoing laparoscopic surgery under general anaesthesia with controlled ventilation. "The findings of this study demonstrate that both airway devices were effective in maintaining adequate ventilation and oxygenation, but the Baska mask offered important advantages in terms of hemodynamic stability and reduced postoperative airway morbidity. These observations are consistent with the evolving role of supraglottic airway devices in laparoscopic anaesthesia.

In the present study, the baseline demographic characteristics including age, sex distribution, weight, and ASA physical status were comparable between the two groups, indicating that the groups were well matched and suitable for comparison. Similar demographic comparability has been reported in previous airway device studies by Al-Rawahi et al. (2013), Alexiev et al. (2012), and Verma et al. (2020), where fair comparison between supraglottic airway devices and conventional airway techniques was ensured by matching patient characteristics at baseline (16–18).

With respect to insertion characteristics, both devices performed well, with 95% first-attempt success in both groups. Ease of insertion was slightly better in the Baska mask group, though the difference was not statistically significant. These findings are in agreement with Alexiev et al. (2012), who described the Baska mask as a novel supraglottic airway with satisfactory insertion characteristics, and with Verma et al. (2020), who found comparable ease of insertion between the Baska mask and other supraglottic devices (17,18). Al-Rawahi et al. (2013) also reported that the Baska mask provided effective airway placement during positive pressure ventilation (16). This suggests that the Baska mask is not inferior to endotracheal intubation in terms of technical feasibility.

A major finding of the present study was the significantly lower heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure in the Baska mask group following airway insertion and during the peri-extubation period. Endotracheal

intubation produced a greater sympathetic response, resulting in more pronounced hemodynamic fluctuations. This finding is supported by Jarineshin et al. (2015), who demonstrated a better hemodynamic profile with laryngeal mask airway insertion compared to laryngoscopy and tracheal intubation (19). Therefore, the Baska mask may be particularly advantageous in patients where hemodynamic stability is desirable.

Laparoscopic surgery presents special ventilatory challenges because pneumoperitoneum reduces lung compliance and increases airway pressure, as described by Crozier (2004), Sood and Jain, and Atkinson et al. (2017) (20,21). Despite these concerns, oxygen saturation remained above 97% in both groups throughout the procedure in the present study, indicating that both devices ensured satisfactory oxygenation. End tidal carbon dioxide was also effectively maintained in both groups, with slightly better control in the Baska mask group at certain intervals. These findings support earlier reports by Belena et al. (2015), Carrio Font et al. (2016), and Anil Kumar et al. (2018), who concluded that supraglottic airway devices, particularly the Baska mask, can provide adequate ventilation even during laparoscopic surgeries requiring positive pressure ventilation (22–24).

Postoperative airway complications were significantly lower in the Baska mask group, particularly sore throat and dysphagia. This is comparable with the findings of Yu and Beirne (2010), who reported lower airway complication rates with laryngeal mask airways than with endotracheal tubes, and with Asai et al. (1998) who highlighted airway trauma and postoperative discomfort as common problems with tracheal intubation (25–27). Thus, the present study further supports the Baska mask as a safe and effective alternative to endotracheal intubation in selected laparoscopic procedures.

CONCLUSION

The present study concludes that the Baska mask is a safe and effective alternative to endotracheal intubation for airway management in laparoscopic surgeries under general anaesthesia with controlled ventilation. Both devices demonstrated comparable success rates in terms of insertion attempts and ease of placement. However, the Baska mask was associated with significantly better hemodynamic stability, as evidenced by lower heart rate and blood pressure variations following insertion.

Additionally, oxygenation and ventilation parameters such as SpO_2 and $EtCO_2$ were adequately maintained in both groups, confirming the efficacy of the Baska mask in providing effective ventilation". Importantly, the incidence of postoperative complications such as sore throat and dysphagia was significantly lower with the Baska mask compared to endotracheal intubation. Therefore, the Baska mask can be considered a reliable and less invasive airway device with advantages of reduced hemodynamic stress and improved postoperative comfort in selected patients.

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